

Shot Setup

Jay R. Dittmann

CDF Ace Training
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Beamspeak:

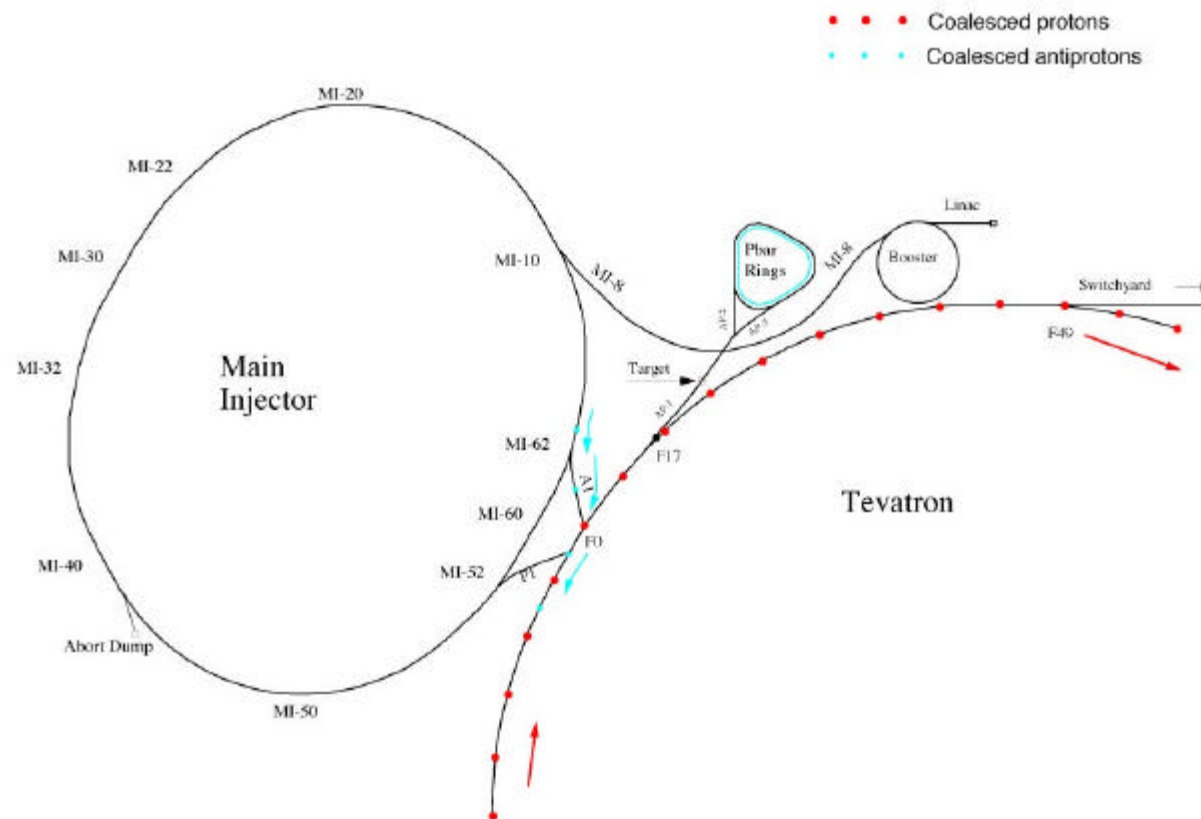
- **Store** — period during which a steady particle beam is present in the Tevatron
 - usually means both protons and antiprotons are present
 - are numbered sequentially
 - can last from minutes to hours to days
 - can sometimes end abruptly

Beamspeak:

(continued)

- **Shot** — the injection of antiprotons from the Accumulator into the Main Injector and on into the Tevatron in preparation for colliding beams operation
- **Shot Setup** — the sequence of events leading to antiproton shots

The Fermilab Accelerator Chain



Shot Setup at CDF — Overview

At the end of the previous store:

- finish the data-taking run
- before previous store is dumped, ramp down HV (allow 5 minutes)

The Main Control Room (MCR) should notify CDF in advance of planned beam dumps.

Shot Setup at CDF — Overview

Between one store and the next:

- Assume sufficient pbars to shoot again
- Time between shots:
 - currently 2-3 hours (on a good day)
 - Beams Division aims to reduce the time to 1 hour
- Calibrations (Quiet Time?)

Shot Setup at CDF — Overview

Beginning the next store:

- Protons are injected first, then pbars
- Accelerate beams to 980 GeV
- Cogging
- Low Beta Squeeze
- Scraping

Once losses are low and the beam is stable, Ramp HV and begin taking data.

Shot Setup at CDF — More detail

- *Injection* — the process of transferring protons or antiprotons from the Main Injector to the Tevatron (4 bunches at a time)
- *Ramping* — the magnetic fields of the magnets are increased simultaneously, boosting proton/pbar energies from 150 GeV to 980 GeV (“flattop”)

Shot Setup at CDF — More detail

- *Cogging* — the process of spacing bunches of protons or pbars in the Tevatron so that they will collide at the proper points in the ring
- *Low beta squeeze* — after injecting protons and pbars into the Tevatron, a special set of quadrupoles (“low beta quads”) are turned on at B0 to reduce the size of the beam and increase luminosity
- *Scraping* — using collimators to remove the beam “halo” and reduce losses

MCR will notify CDF when scraping is complete!

Shot Setup — What to watch in ACNET

A shot is going in...

- **C:B0PLOS** – B0 proton losses from BSC (Hz)
- **C:B0ALOS** – B0 antiproton losses from BSC (Hz)
- **C:LOSTP** – Proton losses – fast response (Hz)
- **C:LOSTPB** – Antiproton losses – fast response (Hz)
- **C:B0ILUM** – B0 delivered instantaneous luminosity ($\text{E30 cm}^{-1} \text{ s}^{-1}$)
- **C:B0Q5** – Current in B0 low beta quads (amps)
- **T: ERING** – Tevatron energy (GeV)
- **T: IBEAM** – Tevatron beam current (E12)
- **E: SVRAD(0-3)** – SVX integrated radiation dose (rad)
- **E: SVBLA(0,1), SVBLB(0,1)** – SVX rad instantaneous rates (rad/s)

During store, also monitor...

- **C:B0ILUM** – B0 delivered instantaneous luminosity ($\text{E30 cm}^{-1} \text{ s}^{-1}$)
- **C:B0LLUM** – B0 live instantaneous luminosity ($\text{E30 cm}^{-1} \text{ s}^{-1}$)
- **C:B0TLUM** – integrated delivered luminosity (nb^{-1})
- **C:B0TLIV** – integrated live luminosity (nb^{-1})

Example: Shot setup on April 1, 2001 — proton only

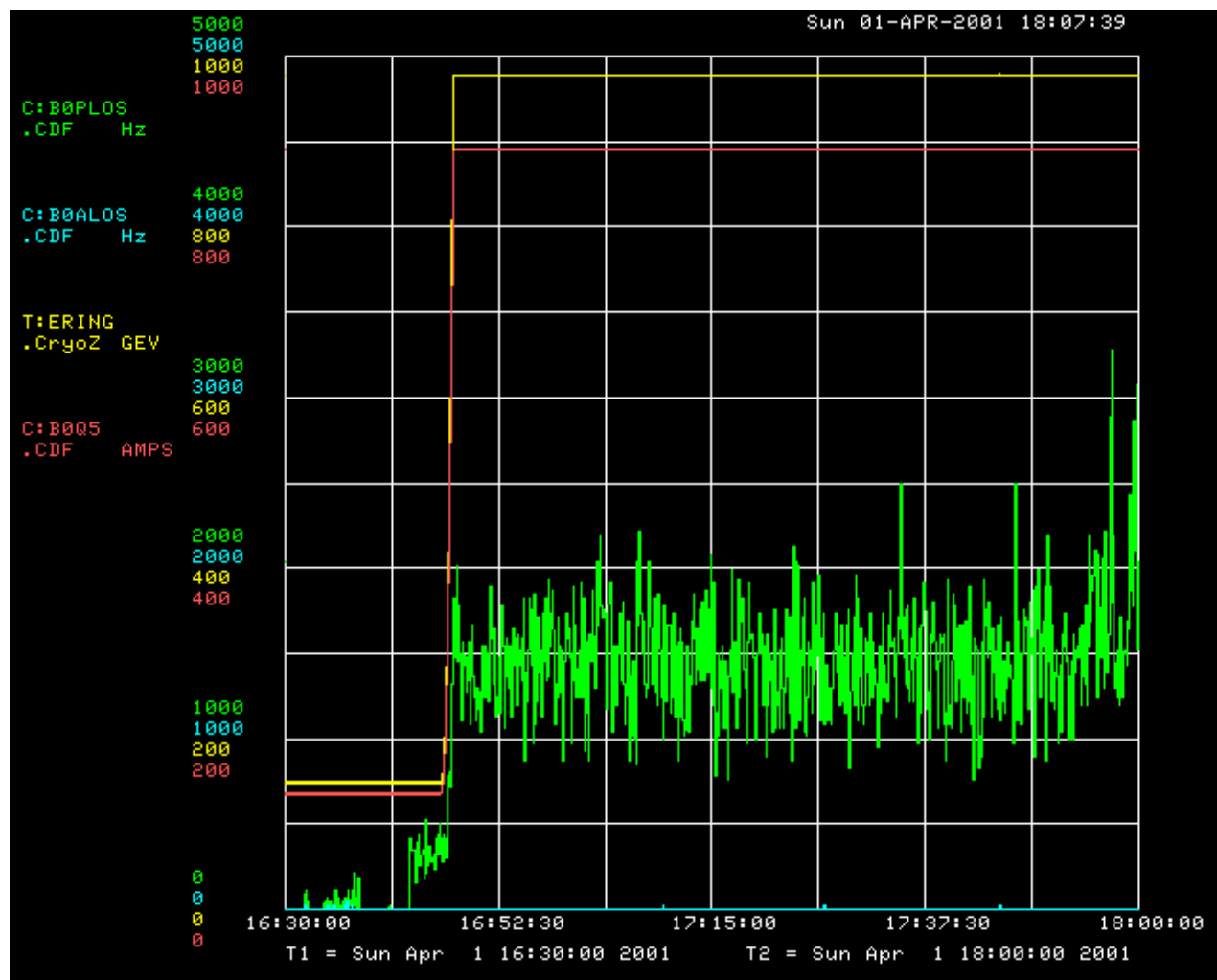
C:B0PLOS

C:B0ALOS

T:ERING

C:B0Q5

**Use ACNET
page E11
(E-Z Writer)
to create**



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Example: Shot setup on July 7, 2001 (Evening shift) (TeV store 567)

[Start Shift](#) [Make Entry](#) [End Shift](#) [Prev](#) [Next](#) [Latest](#) [Contents](#) [Search](#) [Add Graph](#)
[Multi-Shift](#) [Fix List](#) [Home](#)

● [Sat Jul 7 18:25:41](#)
Protons in TeV. First set of pbars in.
- Tom LeCompte

● [Sat Jul 7 18:26:35](#)
PSM alarm from 2RR30C_2. They are working on the this crate, so I don't worry. However, whilst trying to look at the PSM pages I gets lots of IFIX errors and then IFIX kills itself. I restart it following the instructions in the white folder.
Once IFIX is restarted I try to look at the PSM pages again. I can see them, but I still get IFIX errors. - Victoria

● [Sat Jul 7 18:29:54](#) The COT was OFF, now it's in low standby.
Mike has put the TOF on. - Victoria

● [Sat Jul 7 18:54:35](#) Protons and pbars in at 150 GeV. - TJL

● [Sat Jul 7 18:56:07](#) TeV at 980 GeV. - TJL

● [Sat Jul 7 19:03:10](#)
New trigger table test without beam:
▪ Physics_0_00[2,158] tested in run 119607 (2k evts) looks ok
▪ Physics_I_0_00[1,159] tested in run 119608 (1k evts) looks ok
▪ Physics_D_0_00[5,160] tested in run 119609 (1k events) looks ok
All those tests ended to be useless as Farrukh found out that from the guilty parties that they didn't gave him the right set of corrections. Have to do it all again!
- Anyes
-- Sat Jul 7 20:28:42 comment by...Anyes --
Farrukh has disable those tables since there are useless. Will need to restart RC.

● [Sat Jul 7 19:03:25](#) Squeeze completed. Pbar losses ~20 KHz, P losses ~15 kHz. - TJL

Example: Shot setup on July 7, 2001 (Evening shift)
(TeV store 567)

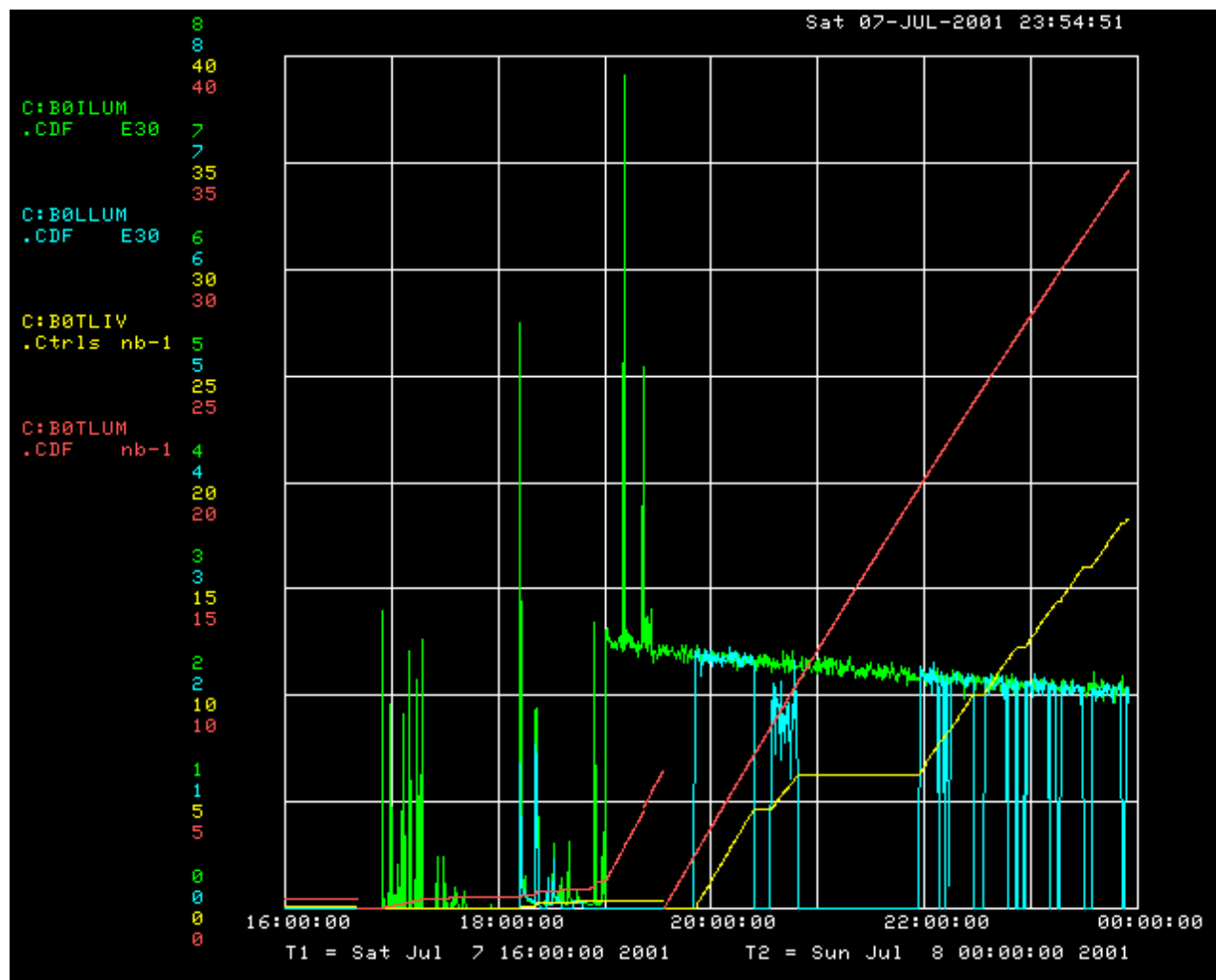
C:BOILUM

C:BOLLUM

C:BOTLIV

C:BOTLUM

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Example: Shot setup on July 7, 2001 (Evening shift)
(TeV store 567)

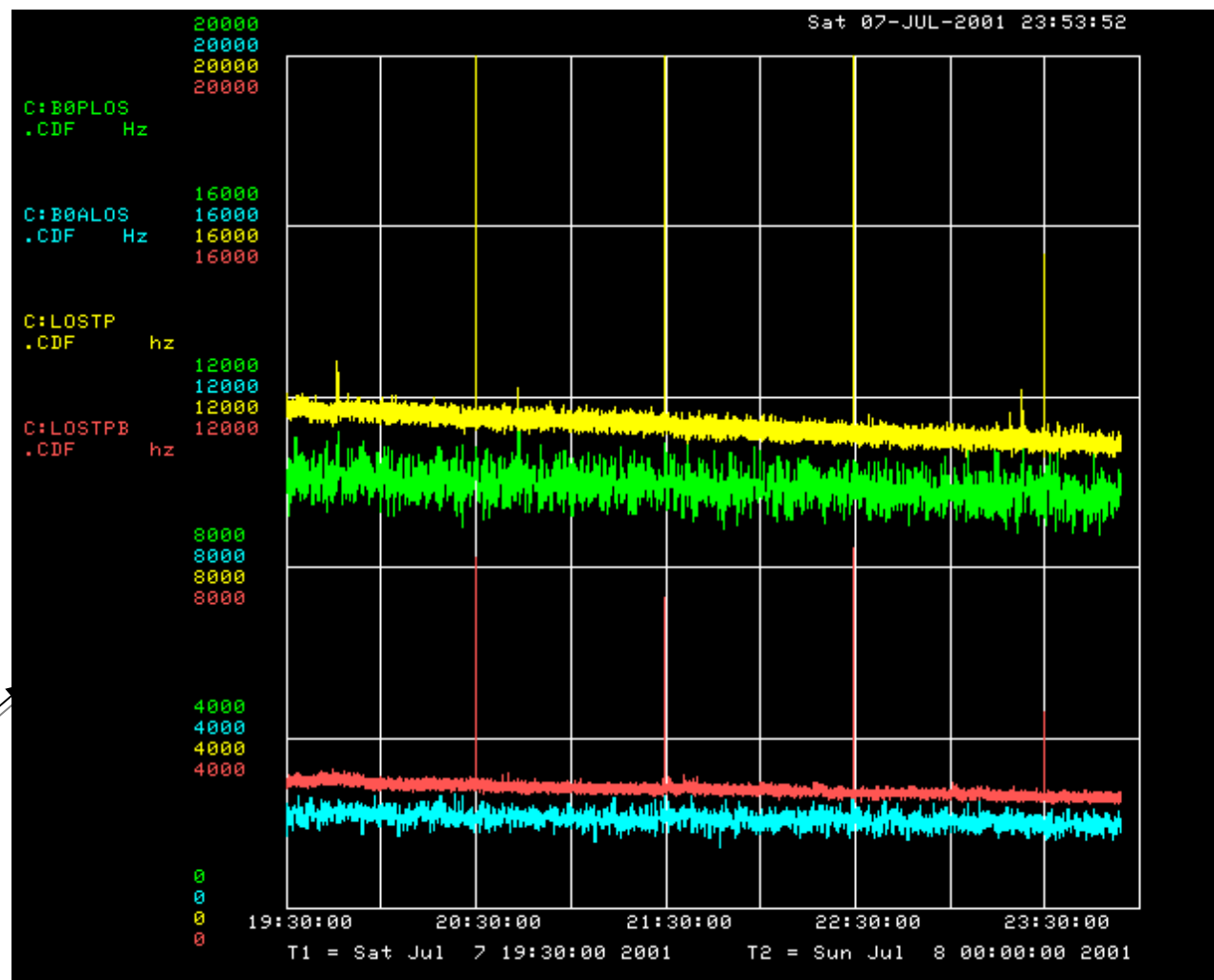
C:BOPLOS

C:BOALOS

C:LOSTP

C:LOSTPB

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Shot Setup — What to watch in ACNET

To measure losses for the silicon detectors:

- **E: SVBLA1** – west inner BLM instantaneous loss rate (rad/s)
- **E: SVBLA2** – west outer BLM instantaneous loss rate (rad/s)
- **E: SVBLB1** – east inner BLM instantaneous loss rate (rad/s)
- **E: SVBLB2** – east outer BLM instantaneous loss rate (rad/s)

- **E: SVRAD0** – west inner BLM integrated dose (rad)
- **E: SVRAD1** – west outer BLM integrated dose (rad)
- **E: SVRAD2** – east inner BLM integrated dose (rad)
- **E: SVRAD3** – east outer BLM integrated dose (rad)

Example: Shot setup on July 7, 2001 (Evening shift)
(TeV store 567)

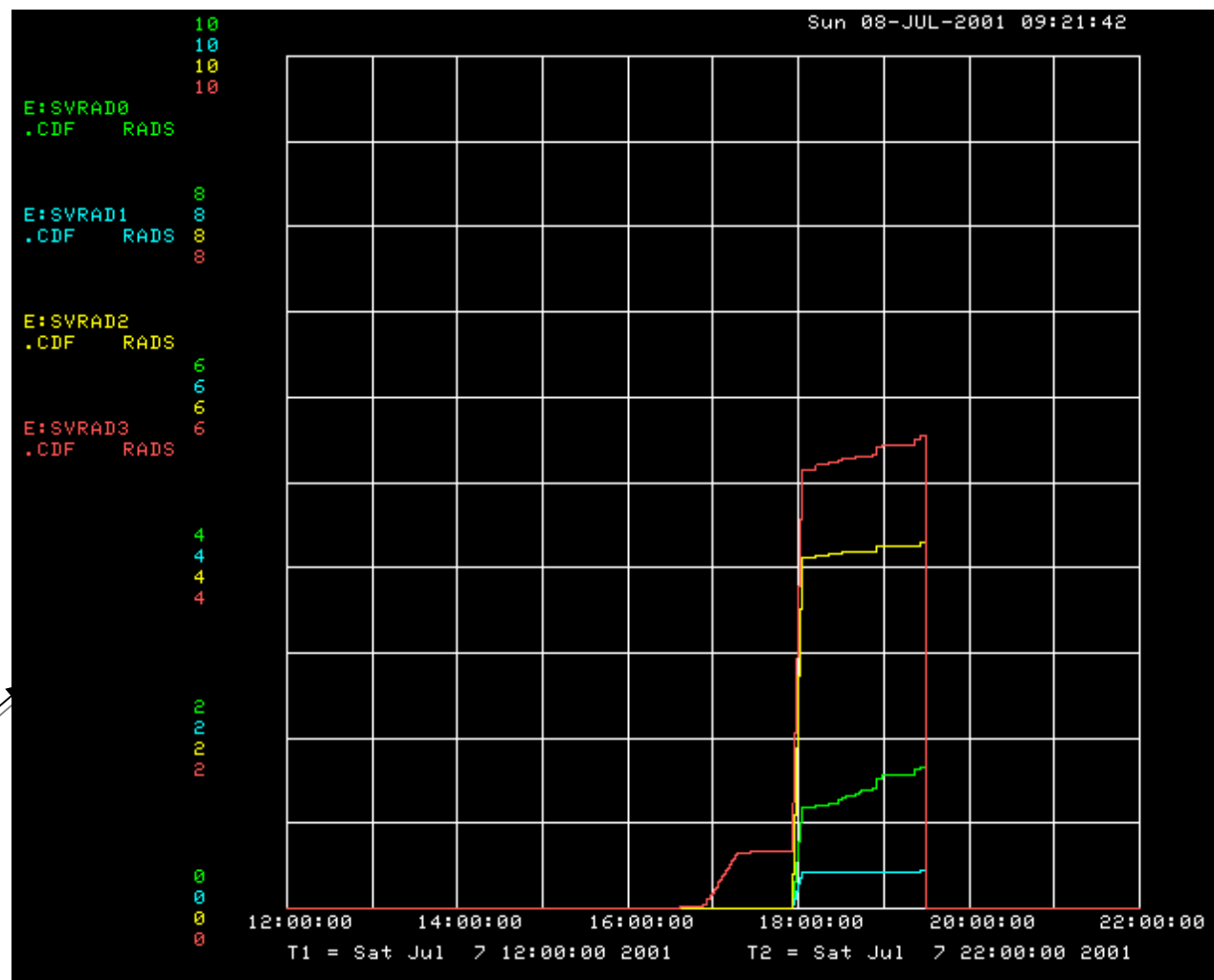
E:SVRAD0

E:SVRAD1

E:SVRAD2

E:SVRAD3

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ACNET page E20 allows you to monitor the current values of the instantaneous and integrated dose rates.

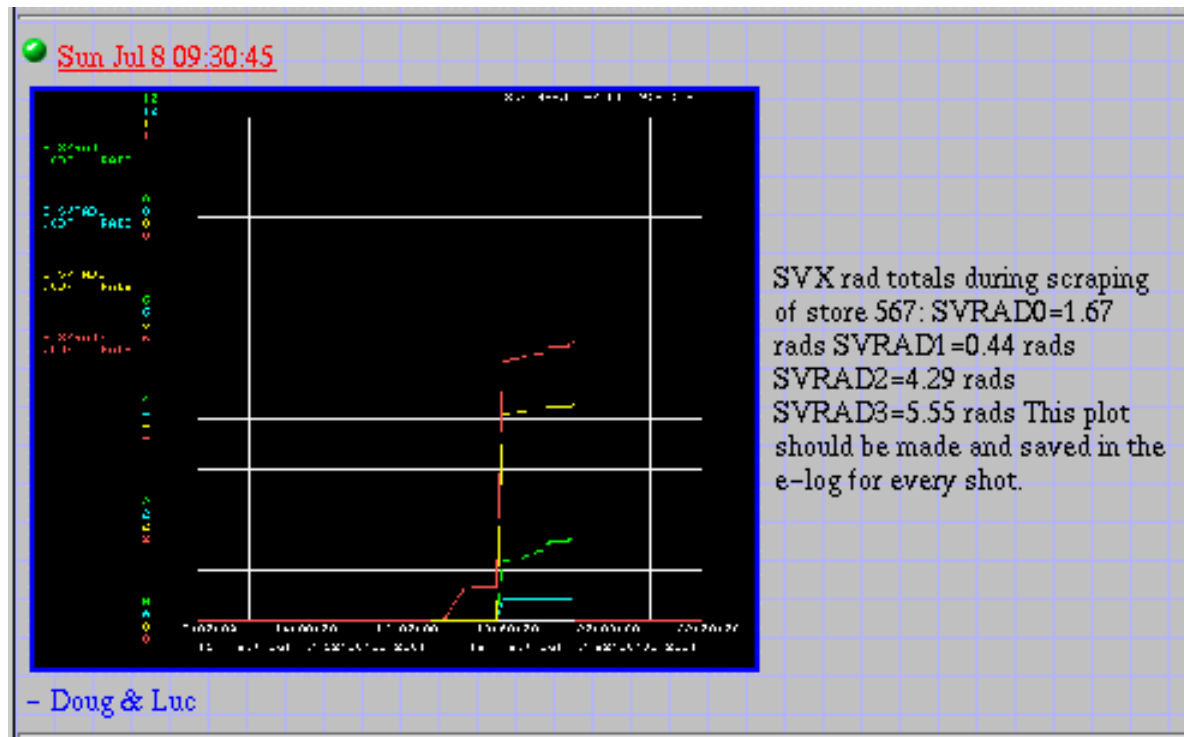
```
E20                               SVX Rad Scaler Readout                               ♦Pgm_Tools♦

*Global Reset                                *Plot FIFO
                                           *Select Display Options
                                           *Display Logged Data
                                           Fifos Recording

                                           Rate (R/s) Sum (Rads)
W Inner BLM                               0          .0378
W Outer BLM                               0           0
E Inner BLM                               0          4.192
E Outer BLM                               0          3.189

----- Messages -----
Welcome to the SVX Loss Monitor Page
```

SVX rad totals should be recorded for every shot!



It is important to have these plots up to watch rates during ramping, squeezing, and scraping.

Example: TeV store 567 on July 8, 2001 (Owl shift)

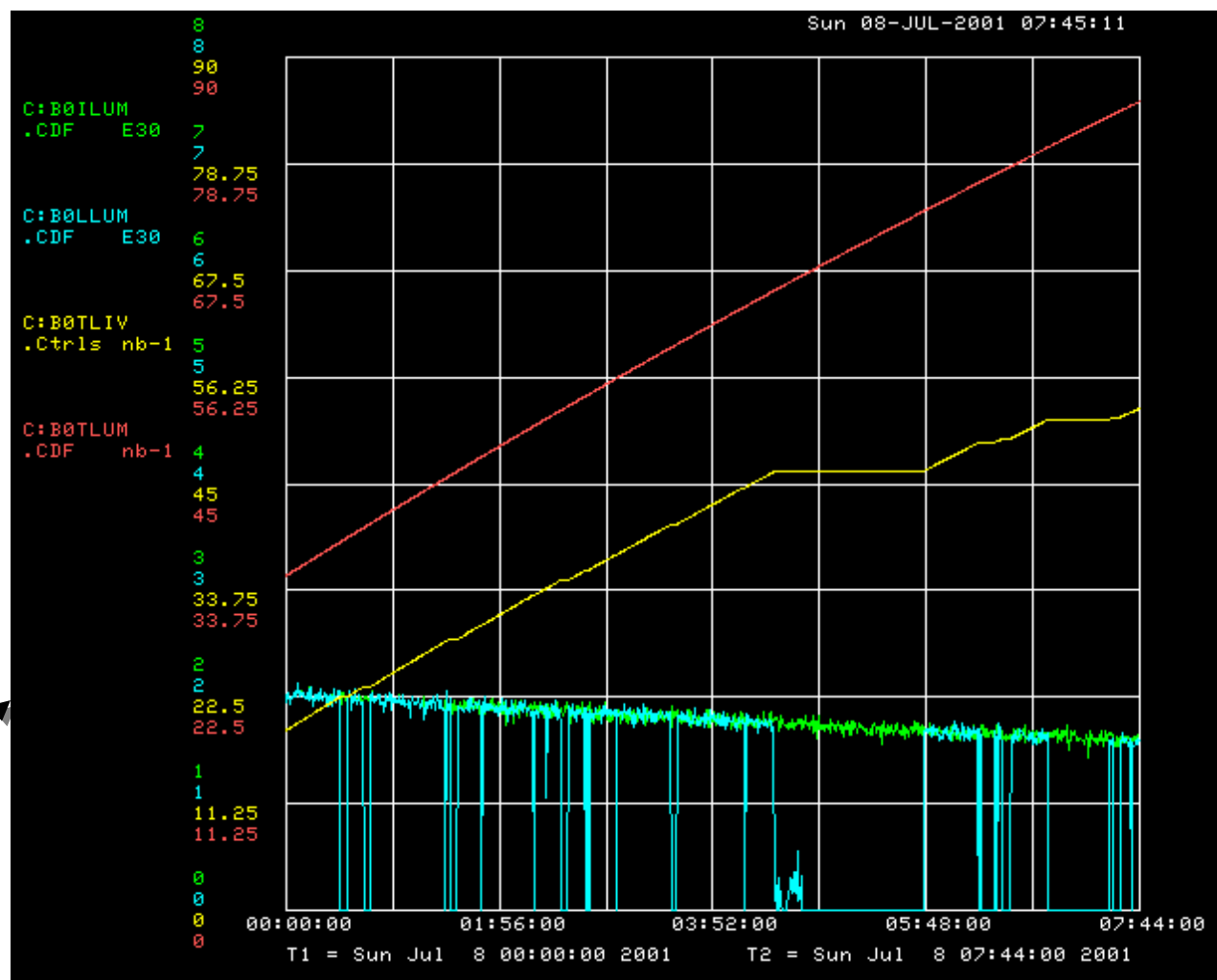
C:BOILUM

C:BOLLUM

C:BOTLIV

C:BOTLUM

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Shot Setup — What to remember

- **Use ACNET to follow the progress of Shot Setup**
- **For each shot, record:**
 - ✓ The times of various milestones:
 - proton/antiproton injection complete
 - ramping to flattop
 - cogging, low beta squeeze
 - scraping complete
 - ✓ The loss rates before and after scraping (plot)
 - ✓ Initial instantaneous luminosity
 - ✓ Integrated delivered / live luminosity per shift (plot)
 - ✓ SVX rad totals (plot)